gamma difference (2%/2mm reference criteria) was only 0.23 ± 0.20 (1 SDV) and the average difference in maximum PTV dose 1.3 ± 2.1 %.
Without any user interaction our inter-fraction QA checks provide an improved understanding of the dosimetric impact of parameter changes in the OIS. Figure 1 shows an example for prostate cancer patients in which leaves in an imaging field were modified in the OIS to improve the visibility of markers used for set-up correction.

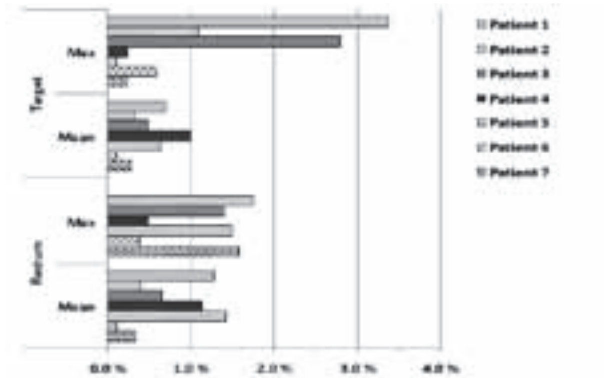

Figure 1: Differences in target and rectum doses between original and adjusted plans for prostate patients.

Conclusions: The new automated workflow, based on independent and repeat 3D dose calculations for all patients, has replaced our MU-check. In addition it checks the integrity of OIS treatment parameters on a daily basis and quantifies the dosimetric impact of changes. Without increasing workload, this contributes to increased patient safety.

PO-0827

Validation of a phase space determination algorithm for intra-operative radiation therapy

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Purpose/Objective: Monte-Carlo (MC) methods are a valuable tool for dosimetry in radiotherapy, including Intra-Operative Electron Radiotherapy (IOERT), since effects such as inhomogeneities or beam hardening may be realistically reproduced. MC calculations require a reliable description of the electron or photon beam that delivers the dose, which should be obtained from detailed MC simulations of the accelerator. Alternatively, it has been proposed a method to derive Phase Space files (PHSP) suitable to IOERT from dose measurements in homogeneous media [1], without the need of a detailed description of the accelerator head or applicator. To validate this procedure, we compared dose computed with the solution PHSP with measurements in phantoms designed to prove actual IOERT scenarios.

Materials and Methods: PHSP were reconstructed from dose measurements in water [1]. The resulting PHSP were then employed to calculate doses in validation phantoms, such as lung-water, bone-water, air-water step, among others, at electron energies of 12 MeV, and lead-water at 20 MeV. Phantoms were irradiated and dose was measured with radiochromic EBT3 films. The films were scanned in a EPSON Perfection V750 Pro and analyzed using the three-channel information corrected by inhomogeneity [2]. Accuracy of the dose measured in the films was estimated using reference measurements with uniform fields from 0 to 6 Gy. More than 95% of 1x1 mm^2 voxels in the film showed deviations from the average uniform reference dose below 0.005 Gy or 1% of the dose, whichever is larger. Simulations and experimental data were compared in detail. Absolute calibration of the MC PHSP was done at the maximum of the measured PDD in water.

Results: MC simulations are in good agreement with experimental data, at the 2%-2 mm level (10% dose threshold) for most setups, well within what is needed for IOERT planning. Accuracy of the comparison was mostly limited by the difficulty in assuring geometrical positioning of the physical phantoms within 2 mm of less. An example of dose profiles on a heterogeneous phantom of water and cork (simulating mediastinum region) is shown in **figure 1**.

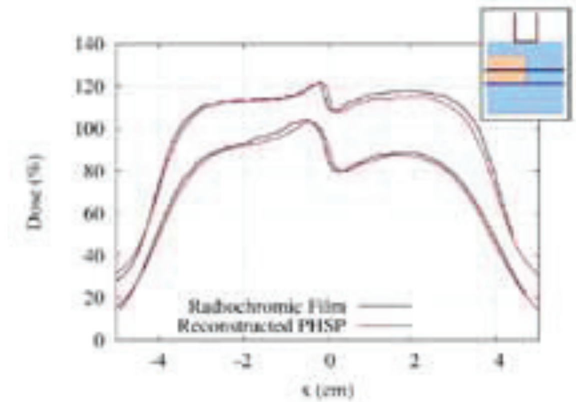

Figure1. Transverse dose profiles at 2.5 (shifted up by 20%) and 3.5 cm depth.

Conclusions: Preliminary results show that the PHSP reconstructed from dose measurements in water as described in [1] reproduce experimental data from different setups and energies, accurately enough for MC dose estimations. The MC dose algorithm and procedure to obtain the solution PHSP have been incorporated in Radiance® [3], a powerful Treatment Planning System for intra-operative radiation therapy developed by the GMV company.

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[2] A.Micke *et al*. 2011. Med. Phys.,38(5), pp. 2523-2534
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PO-0828

Dose calculation accuracy in the build-up region of flattening filter-free photon beams

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Purpose/Objective: To compare dose calculation accuracy in the build-up region of conventional (FF) versus flattening filter-free (FFF) megavoltage photon beams.

Materials and Methods: Radiochromic film (Gafchromic EBT2) and extrapolation chamber (EPC) dosimetry were performed in the build-up region of 6MV energy-matched and 10MV non-matched FF and FFF beams with varying field size, elongation and position relative to the central axis (5x5, 5x20, 10x10, 10x20,15x15 cm² positioned centrally, 5cm and 10 cm off-axis). All beams were provided by an Elekta Precise linear accelerator (Elekta Crawley, West-Sussex,UK), equipped with a 2 mm steel disk in the FFF beam line. The gantry angle was always 90°. Radiochromic films were irradiated in a parallel orientation in a 30x30x30 cm³ polystyrene phantom. The extrapolation chamber was mounted horizontally on a vertical stand, allowing for the acquisition of depth-ionization profiles by adding polystyrene phantom slabs while laterally adjusting the table position. In order to ensure a fair comparison, the absorbed dose was investigated relatively to the dose delivered locally at a reference depth of 10 cm. For the 10MV beams, the measured doses were compared to dose calculations by the XVMC-based dose engine implemented in the Monaco treatment planning system (version 3.2, Elekta CMS software).

Results: Relatively to the absorbed dose at 10cm depth, all centrally positioned FFF fields demonstrated higher doses at the central axis at 1 mm depth compared to the corresponding FF fields (5-15%). Differences were, however, less pronounced for the off-axis fields (0.73 - 11.13% for the 10 cm off-axis fields). Moreover, extrapolation chamber results for the centrally positioned fields suggest the dose differences between FF and FFF beams to become much smaller at shallower depths (0.06-0.47% at 0.0075 mm depth). These tendencies are clearly illustrated by the PDDs depicted in the figure, measured at 5 mm off-axis for the 10x20 cm² centrally positioned 10MV FF and FFF beams. For both FF and FFF beams, the surface dose generally increased linearly with the field area, though this linear correlation was the most pronounced for the square fields and at the most shallow depths. No consistent shifts in the depth of dose maximum between FF and FFF beams could be detected and the mean shift amounted to only 0.94 mm and 1.55 mm for the 6MV and 10MV beams respectively. For both 10MV FF and FFF beams, important deviations between film measurements and dose calculations (up to 25%) were found.